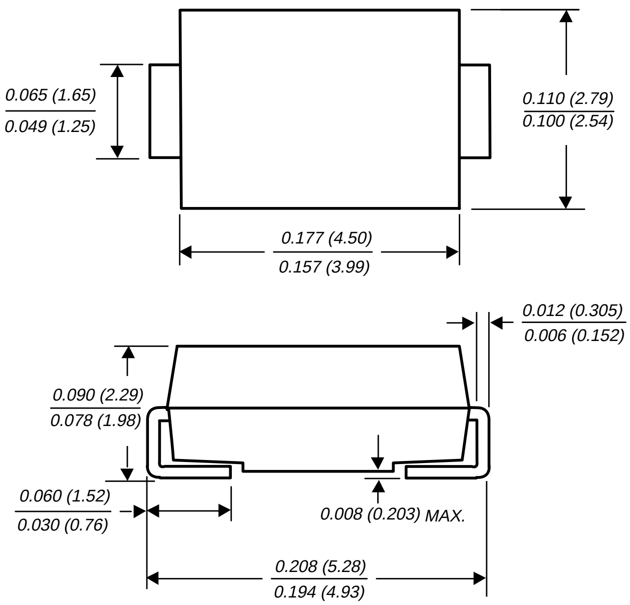
# SMAJ5.0 THRU SMAJ170CA

## SURFACE MOUNT TRANSZORB™ TRANSIENT VOLTAGE SUPPRESSOR

***Stand-off Voltage -** 5.0 to 170 Volts* ***Peak Pulse Power -** 300 Watts*

**DO-214AC**




*Dimensions in inches and (millimeters)*

### FEATURES

- ♦ Optimized for LAN protection applications
- ♦ Ideal for ESD protection of data lines in accordance with IEC 1000-4-2 (IEC801-2)
- ♦ Ideal for EFT protection of data lines in accordance with IEC1000-4-4 (IEC801-4)
- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Glass passivated junction
- ♦ Excellent clamping capability
- ♦ Low incremental surge resistance
- ♦ Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$ min.
- ♦ 300W peak pulse power capability with a 10/1000µs waveform, repetition rate (duty cycle): 0.01%
- ♦ High temperature soldering guaranteed: 250°C/10 seconds at terminals



### MECHANICAL DATA

**Case:** JEDEC DO-214AC molded plastic body over passivated chip
**Terminals:** Solder plated, solderable per MIL-STD-750, Method 2026
**Polarity:** For uni-directional types the color band denotes the cathode, which is postitive with respect to the anode under normal TVS operation
**Mounting Position:** Any
**Weight:** 0.002 ounces, 0.064 gram

### DEVICES FOR BIDIRECTIONAL APPLICATIONS

For bi-directional use suffix C or CA for types SMAJ5.0 thru SMAJ170 (e.g. SMAJ5.0C, SMAJ170CA)
Electrical characteristics apply in both directions.

### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

| | *SYMBOLS* | *VALUE* | *UNITS* |
|---|---|---|---|
| Peak pulse power dissipation with a 10/1000µs waveform (NOTE 1, 2, FIG.1) | $P_{PM}$ | Minimum 300 | Watts |
| Peak pulse current with a 10/1000µs waveform (NOTE 1) | $I_{PPM}$ | SEE TABLE 1 | Amps |
| Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTES 2, 3) - unidirectional only | $I_{FSM}$ | 40.0 | Amps |
| Maximum instantaneous forward voltage at 25A (NOTE 3) | $V_F$ | 3.5 | Volts |
| Operating junction and storage temperature range | $T_J$, $T_{STG}$ | -55 to +150 | °C |

**NOTES**:
(1) Non-repetitive current pulse, per Fig.3 and derated above $T_A$=25°C per Fig. 2
(2) Mounted on 0.2 x 0.2" (5.0 x 5.0mm) copper pads to each terminal
(3) Measured on 8.3ms single half sine-wave. For uni-directional devices only.



GENERAL SEMICONDUCTOR®

## ELECTRICAL CHARACTERISTICS ($T_A$=25°C unless otherwise noted) TABLE 1

| Device | Device Marking Code | | Breakdown Voltage $V_{(BR)}$ (Volts) at $I_T$ (NOTE 1) | | Test Current $I_T$ (mA) | Working Peak Reverse Voltage $V_{WM}$ (Volts) | Maximum Reverse Leakage a $V_{WM}$ (NOTE 3) $I_D$ (μA) | Maximum Peak Pulse Surge Current $I_{PPM}$ (NOTE 2) (Amps) | Maximum Clamping Voltage at $I_{PPM}$ $V_C$ (Volts) |
|---|---|---|---|---|---|---|---|---|---|
| | UNI | BI | Min. | Max. | | | | | |
| SMAJ5.0 | AD | WD | 6.4 | 7.82 | 10 | 5.0 | 800 | 31.3 | 9.6 |
| SMAJ5.0A | AE | WE | 6.4 | 7.07 | 10 | 5.0 | 800 | 32.6 | 9.2 |
| SMAJ6.0 | AF | WF | 6.67 | 8.15 | 10 | 6.0 | 800 | 26.3 | 11.4 |
| SMAJ6.0A | AG | WG | 6.67 | 7.37 | 10 | 6.0 | 800 | 29.1 | 10.3 |
| SMAJ6.5 | AH | WH | 7.22 | 8.82 | 10 | 6.5 | 500 | 24.4 | 12.3 |
| SMAJ6.5A | AK | WK | 7.22 | 7.98 | 10 | 6.5 | 500 | 26.8 | 11.2 |
| SMAJ7.0 | AL | WL | 7.78 | 9.51 | 10 | 7.0 | 200 | 22.6 | 13.3 |
| SMAJ7.0A | AM | WM | 7.78 | 8.6 | 10 | 7.0 | 200 | 25.0 | 12.0 |
| SMAJ7.5 | AN | WN | 8.33 | 10.3 | 1.0 | 7.5 | 100 | 21.0 | 14.3 |
| SMAJ7.5A | AP | WP | 8.33 | 9.21 | 1.0 | 7.5 | 100 | 23.3 | 12.9 |
| SMAJ8.0 | AQ | WQ | 8.89 | 10.9 | 1.0 | 8.0 | 50.0 | 20.0 | 15.0 |
| SMAJ8.0A | AR | WR | 8.89 | 9.83 | 1.0 | 8.0 | 50.0 | 22.1 | 13.6 |
| SMAJ8.5 | AS | WS | 9.44 | 11.5 | 1.0 | 8.5 | 10.0 | 18.9 | 15.9 |
| SMAJ8.5A | AT | WT | 9.44 | 10.4 | 1.0 | 8.5 | 10.0 | 20.8 | 14.4 |
| SMAJ9.0 | AU | WU | 10.0 | 12.2 | 1.0 | 9.0 | 5.0 | 17.8 | 16.9 |
| SMA J9.0A | AV | WV | 10.0 | 11.1 | 1.0 | 9.0 | 5.0 | 19.5 | 15.4 |
| SMAJ10 | AW | WW | 11.1 | 13.6 | 1.0 | 10.0 | 5.0 | 16.0 | 18.8 |
| SMAJ10A | AX | WX | 11.1 | 12.3 | 1.0 | 10.0 | 5.0 | 17.6 | 17.0 |
| SMAJ11 | AY | WY | 12.2 | 14.9 | 1.0 | 11.0 | 5.0 | 14.9 | 20.1 |
| SMAJ11A | AZ | WZ | 12.2 | 13.5 | 1.0 | 11.0 | 5.0 | 16.5 | 18.2 |
| SMAJ12 | BD | XD | 13.3 | 16.3 | 1.0 | 12.0 | 5.0 | 13.6 | 22.0 |
| SMAJ12A | BE | XE | 13.3 | 14.7 | 1.0 | 12.0 | 5.0 | 15.1 | 19.9 |
| SMAJ13 | BF | XF | 14.4 | 17.6 | 1.0 | 13.0 | 5.0 | 12.6 | 23.8 |
| SMAJ13A | BG | XG | 14.4 | 15.9 | 1.0 | 13.0 | 5.0 | 14.0 | 21.5 |
| SMAJ14 | BH | XH | 15.6 | 19.1 | 1.0 | 14.0 | 5.0 | 11.6 | 25.8 |
| SMAJ14A | BK | XK | 15.6 | 17.2 | 1.0 | 14.0 | 5.0 | 12.9 | 23.2 |
| SMAJ15 | BL | XL | 16.7 | 20.4 | 1.0 | 15.0 | 5.0 | 11.2 | 26.9 |
| SMAJ15A | BM | XM | 16.7 | 18.5 | 1.0 | 15.0 | 5.0 | 12.3 | 24.4 |
| SMAJ16 | BN | XN | 17.8 | 21.8 | 1.0 | 16.0 | 5.0 | 10.4 | 28.8 |
| SMAJ16A | BP | XP | 17.8 | 19.7 | 1.0 | 16.0 | 5.0 | 11.5 | 26.0 |
| SMAJ17 | BQ | XQ | 18.9 | 23.1 | 1.0 | 17.0 | 5.0 | 9.8 | 30.5 |
| SMAJ17A | BR | XR | 18.9 | 20.9 | 1.0 | 17.0 | 5.0 | 10.9 | 27.6 |
| SMAJ18 | BS | XS | 20.0 | 24.4 | 1.0 | 18.0 | 5.0 | 9.3 | 32.2 |
| SMAJ18A | BT | XT | 20.0 | 22.1 | 1.0 | 18.0 | 5.0 | 10.3 | 29.2 |
| SMAJ20 | BU | XU | 22.2 | 27.1 | 1.0 | 20.0 | 5.0 | 8.4 | 35.8 |
| SMAJ20A | BV | XV | 22.2 | 24.5 | 1.0 | 20.0 | 5.0 | 9.3 | 32.4 |
| SMAJ22 | BW | XW | 24.4 | 29.8 | 1.0 | 22.0 | 5.0 | 7.6 | 39.4 |
| SMAJ22A | BX | XX | 24.4 | 26.9 | 1.0 | 22.0 | 5.0 | 8.5 | 35.5 |
| SMAJ24 | BY | XY | 26.7 | 32.6 | 1.0 | 24.0 | 5.0 | 7.0 | 43.0 |
| SMAJ24A | BZ | XZ | 26.7 | 29.5 | 1.0 | 24.0 | 5.0 | 7.7 | 38.9 |
| SMAJ26 | CD | YD | 28.9 | 35.3 | 1.0 | 26.0 | 5.0 | 6.4 | 46.6 |
| SMAJ26A | CE | YE | 28.9 | 31.9 | 1.0 | 26.0 | 5.0 | 7.1 | 42.1 |
| SMAJ28 | CF | YF | 31.1 | 38.0 | 1.0 | 28.0 | 5.0 | 6.0 | 50.0 |
| SMAJ28A | CG | YG | 31.1 | 34.4 | 1.0 | 28.0 | 5.0 | 6.6 | 45.4 |
| SMAJ30 | CH | YH | 33.3 | 40.7 | 1.0 | 30.0 | 5.0 | 5.6 | 53.5 |
| SMAJ30A | CK | YK | 33.3 | 36.8 | 1.0 | 30.0 | 5.0 | 6.2 | 48.4 |
| SMAJ33 | CL | YL | 36.7 | 44.9 | 1.0 | 33.0 | 5.0 | 5.1 | 59.0 |
| SMAJ33A | CM | YM | 36.7 | 40.6 | 1.0 | 33.0 | 5.0 | 5.6 | 53.3 |
| SMAJ36 | CN | YN | 40.0 | 48.9 | 1.0 | 36.0 | 5.0 | 4.7 | 64.3 |
| SMAJ36A | CP | YP | 40.0 | 44.2 | 1.0 | 36.0 | 5.0 | 5.2 | 58.1 |
| SMAJ40 | CQ | YQ | 44.4 | 54.3 | 1.0 | 40.0 | 5.0 | 4.2 | 71.4 |
| SMAJ40A | CR | YR | 44.4 | 49.1 | 1.0 | 40.0 | 5.0 | 4.7 | 64.5 |
| SMAJ43 | CS | YS | 47.8 | 58.4 | 1.0 | 43.0 | 5.0 | 3.9 | 76.7 |
| SMAJ43A | CT | YT | 47.8 | 52.8 | 1.0 | 43.0 | 5.0 | 4.3 | 69.4 |
| SMAJ45 | CU | YU | 50.0 | 61.1 | 1.0 | 45.0 | 5.0 | 80.3 | 3.7 |
| SMAJ45A | CV | YV | 50.0 | 55.3 | 1.0 | 45 | 5.0 | 72.7 | 4.1 |
| SMAJ48 | CW | YW | 53.3 | 65.1 | 1.0 | 48 | 5.0 | 85.5 | 3.5 |
| SMAJ48A | CX | YX | 53.3 | 58.9 | 1.0 | 48 | 5.0 | 77.4 | 3.9 |
| SMAJ51 | CY | YY | 56.7 | 69.3 | 1.0 | 51 | 5.0 | 91.1 | 3.3 |
| SMAJ51A | CZ | YZ | 56.7 | 62.7 | 1.0 | 51 | 5.0 | 82.4 | 3.6 |

## ELECTRICAL CHARACTERISTICS ($T_A$=25°C unless otherwise noted) TABLE 1 (Cont'd)

| Device | Device Marking Code UNI | Device Marking Code BI | Breakdown Voltage $V_{(BR)}$ (Volts) at $I_T$ (NOTE 1) Min. | Max. | Test Current $I_T$ (mA) | Working Peak Reverse Voltage $V_{WM}$ (Volts) | Maximum Reverse Leakage a $V_{WM}$ (NOTE 3) $I_D$ (µA) | Maximum Peak Pulse Surge Current $I_{PPM}$ (NOTE 2) (Amps) | Maximum Clamping Voltage at $I_{PPM}$ Vc (Volts) |
|---|---|---|---|---|---|---|---|---|---|
| SMAJ54 | RD | ZD | 60.0 | 73.3 | 1.0 | 54 | 5.0 | 96.3 | 3.1 |
| SMAJ54A | RE | ZE | 60.0 | 66.3 | 1.0 | 54 | 5.0 | 87.1 | 3.4 |
| SMAJ58 | RF | ZF | 64.4 | 78.7 | 1.0 | 58 | 5.0 | 103 | 2.9 |
| SMAJ58A | RG | ZG | 64.4 | 71.2 | 1.0 | 58 | 5.0 | 93.6 | 3.2 |
| SMAJ60 | RH | ZH | 66.7 | 81.5 | 1.0 | 60 | 5.0 | 107 | 2.8 |
| SMAJ60A | RK | ZK | 66.7 | 73.7 | 1.0 | 60 | 5.0 | 96.8 | 3.1 |
| SMAJ64 | RL | ZL | 71.1 | 86.4 | 1.0 | 64 | 5.0 | 114 | 2.6 |
| SMAJ64A | RM | ZM | 71.1 | 78.6 | 1.0 | 64 | 5.0 | 103 | 2.9 |
| SMAJ70 | RN | ZN | 77.8 | 95.1 | 1.0 | 70 | 5.0 | 125 | 2.4 |
| SMAJ70A | RP | ZP | 77.8 | 86 | 1.0 | 70 | 5.0 | 113 | 2.7 |
| SMAJ75 | RQ | ZQ | 83.3 | 102 | 1.0 | 75 | 5.0 | 134 | 2.2 |
| SMAJ75A | RR | ZR | 83.3 | 92.1 | 1.0 | 75 | 5.0 | 121 | 2.5 |
| SMAJ78 | RS | ZS | 86.7 | 106 | 1.0 | 78 | 5.0 | 139 | 2.2 |
| SMAJ78A | RT | ZT | 86.7 | 95.8 | 1.0 | 78 | 5.0 | 126 | 2.4 |
| SMAJ85 | RU | ZU | 94.4 | 115 | 1.0 | 85 | 5.0 | 151 | 2 |
| SMAJ85A | RV | ZV | 94.4 | 104 | 1.0 | 85 | 5.0 | 137 | 2.2 |
| SMAJ90 | RW | ZW | 100 | 122 | 1.0 | 90 | 5.0 | 160 | 1.9 |
| SMAJ90A | RX | ZX | 100 | 111 | 1.0 | 90 | 5.0 | 146 | 2.1 |
| SMAJ100 | RY | ZY | 111 | 136 | 1.0 | 100 | 5.0 | 179 | 1.7 |
| SMAJ100A | RZ | ZZ | 111 | 123 | 1.0 | 100 | 5.0 | 162 | 1.9 |
| SMAJ110 | SD | VD | 122 | 149 | 1.0 | 110 | 5.0 | 196 | 1.5 |
| SMAJ110A | SE | VE | 122 | 135 | 1.0 | 110 | 5.0 | 177 | 1.7 |
| SMAJ120 | SF | VF | 133 | 163 | 1.0 | 120 | 5.0 | 214 | 1.4 |
| SMAJ120A | SG | VG | 133 | 147 | 1.0 | 120 | 5.0 | 193 | 1.6 |
| SMAJ130 | SH | VH | 144 | 176 | 1.0 | 130 | 5.0 | 231 | 1.3 |
| SMAJ130A | SK | VK | 144 | 159 | 1.0 | 130 | 5.0 | 209 | 1.4 |
| SMAJ150 | SL | VL | 167 | 204 | 1.0 | 150 | 5.0 | 268 | 1.1 |
| SMAJ150A | SM | VM | 167 | 185 | 1.0 | 150 | 5.0 | 243 | 1.2 |
| SMAJ160 | SN | VN | 178 | 218 | 1.0 | 160 | 5.0 | 287 | 1.0 |
| SMAJ160A | SP | VP | 178 | 197 | 1.0 | 160 | 5.0 | 259 | 1.2 |
| SMAJ170 | SQ | VQ | 189 | 231 | 1 | 170 | 5.0 | 304 | 0.99 |
| SMAJ170A | SR | VR | 189 | 209 | 1.0 | 170 | 5.0 | 275 | 1.09 |

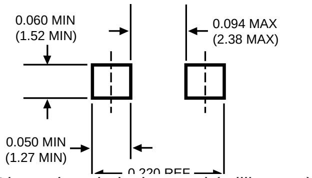
**NOTES:**
(1) $V_{(BR)}$ measured after $I_T$ applied for 300µs square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) For bi-directional types having $V_{WM}$ of 10 Volts and less, the $I_D$ limit is doubled
(4) For the bi-directional SMAJ5.0CA, the maximum $V_{(BR)}$ is 7.25V.
(5) All terms and symbols are consistent with ANSI/IEEE C62.35

# APPLICATION NOTES

## RECOMMENDED PAD LAYOUT

The pad dimensions should be 0.010" (2.5mm) longer than the contact size in the lead axis. This allows a solder fillet to form, see figure below. Contact factory for soldering methods.

**MODIFIED J-BEND**




*Dimensions in inches and (millimeters)*

This device is designed specifically for transient voltage suppression from threats generated by ESD for board level load switching components.

The wide leads assure a large surface contact for good heat dissipation, and a low resistance path for surge current flow to ground.

This series is designed to optimize board space and for use with surface mount technology automated assembly equipment.

They can be easily mounted on printed circuit boards and ceramic substrates to protect sensitive components from transient voltage damage.

FIG. 1 - PEAK PULSE POWER RATING CURVE

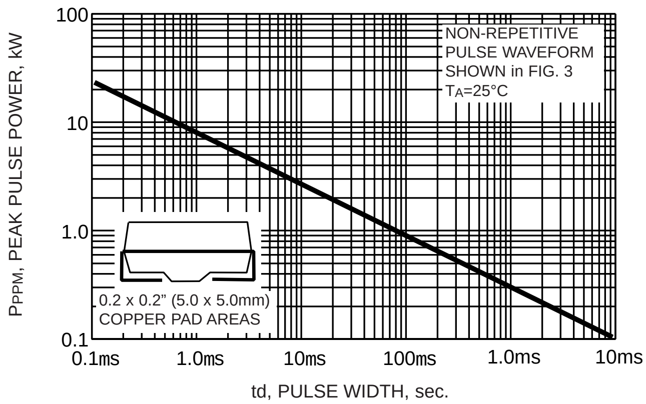



FIG. 2 - PULSE DERATING CURVE

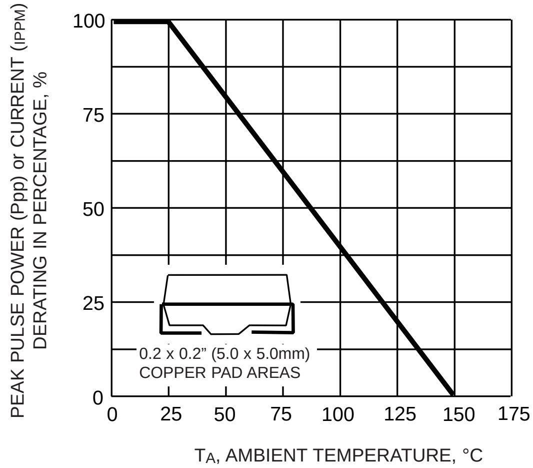



FIG. 3 - PULSE WAVEFORM

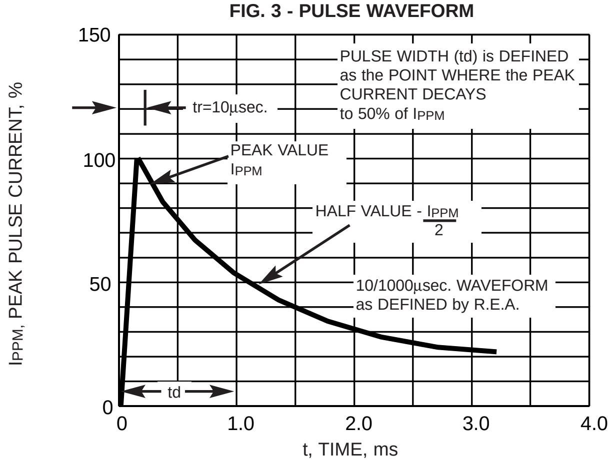



FIG. 4 - TYPICAL JUNCTION CAPACITANCE

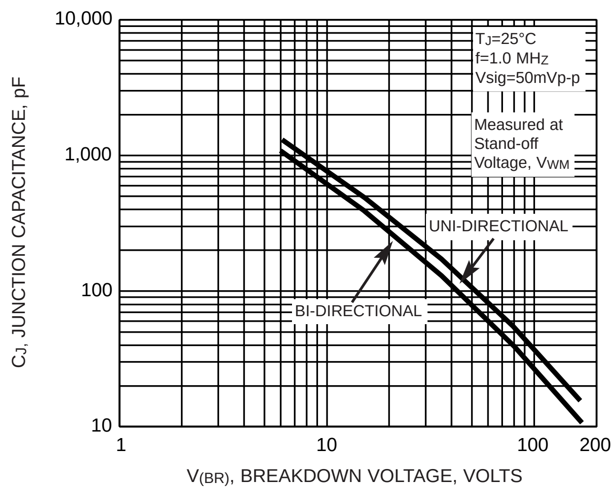



FIG. 5- Typical Response to 8KV Positive Going ESD Pulse Per IEC1000 - 4-2 (IEC801-2)

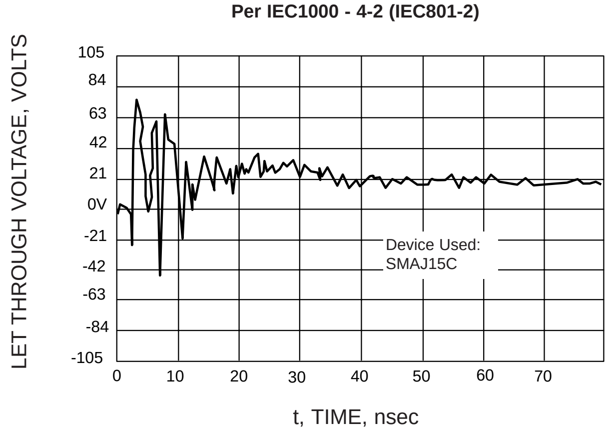



FIG. 6 - MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT UNIDIRECTIONAL ONLY

